



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/646,896	08/25/2003	Chih-Ching Lin	LINC3179/EM	1227

23364 7590 11/03/2004

BACON & THOMAS, PLLC  
625 SLATERS LANE  
FOURTH FLOOR  
ALEXANDRIA, VA 22314

EXAMINER
----------

PHAM, THANHHA S

ART UNIT	PAPER NUMBER
----------	--------------

2813

DATE MAILED: 11/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<p align="center"><b>Office Action Summary</b></p>	Application No. 10/646,896	Applicant(s) LIN ET AL.	
	Examiner Thanhha Pham	Art Unit 2813	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 25 August 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)                                    | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Oath/Declaration*

1. Oath/Declaration filed on 08/25/03 has been considered.

### *Claim Objections*

2. **Claims 1 and 7 are objected to because of informalities. Appropriate corrections are required to clarify the scope of the claim.**

- With respect to claim 1,

lines 2-4, "first dielectric layer" should be changed to "dielectric layer"  
(since claims 1-6 include only one dielectric layer).

- With respect to claim 7,

---

line 8, "forming a photoresist of a predetermined pattern" should be  
changed to "forming a first photoresist of a first predetermined pattern"  
line 11, "removing said photoresist" should be changed to "removing said  
first photoresist"  
line 15, "forming photoresist of a predetermined pattern" should be  
changed to "forming a second photoresist of a second predetermined pattern"  
line 18, "removing the photoresist" should be changed to "removing said  
second photoresist"

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**3. Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (APA) in view of Williams [US 6,087,269].**

➤ With respect to claims 1-3, APA (Description of the Prior Art and figures 1a-1g) substantially discloses the claimed method for forming conducting wires in a semiconductor device comprising steps of:

providing a substrate (10, figure 1a, specification page 1 line 15);

forming a dielectric layer (12, figure 1a, specification page 1 line 15) on said

---

substrate;

digging a via (14, figure 1a, specification page 1 lines 15-16) in said dielectric layer and filling said via with metal (specification page 1 lines 15-16);

forming a conductor layer (162/16/164, figure 1b, specification page 1 lines 18-21) on said dielectric layer including said via;

forming photoresist of a predetermined pattern (182, 184, 186, figure 1c, specification page 1 lines 22-25) on said conductor layer;

removing portions of said conductor layer not covered with said photoresist to form the conducting wire (see figure 1d, specification page 1 lines 22-25);  
and

Art Unit: 2813

removing said photoresist (see figures 1c-1d).

APA does not teach:

- forming a metal layer on said conductor such that said photoresist of said predetermined pattern being formed on said metal layer, and removing portions of said conductor layer and metal layer not covered with said photoresist being removed to form the conducting wiring **[claim 1]**;
- wherein the material of said metal layer is different from that of the conductor layer **[claim 2]**;
- wherein the material of said metal layer is tungsten **[claim 3]**.

However, Williams (figures 2-5, col. 2 lines 19-34 and col. 3 lines 4-58) teaches: forming the metal layer (16, figure 2) of tungsten on the conductor layer (10/12/14), the metal layer being different to the conductor layer; forming the photoresist of predetermined pattern (18, figure 4) on said metal layer; and removing portions of said conductor layer and metal layer not covered with said photoresist to form the conducting wire (figure 5, col. 3 lines 49-52).

Therefore, at the time of invention, it would have been obvious for those skilled in the art to modify process of APA by forming the metal layer and removing the portions of the metal layer and the conductor layer to form the conducting wire as being claimed, per taught by Williams, to improve the process of forming conducting wires with a better resolution patterning and less resist erosion (see Williams: col. 2 lines 1-3, 18-21 & 36-34 and col. 3 lines 23-27 & 49-55).

Art Unit: 2813

➤ With respect to claims 7-9, APA (Description of the Prior Art and figures 1a-1g) substantially discloses the claimed method for forming conducting wires and contact openings in a semiconductor device comprising steps of:

providing a substrate (10, figure 1a, specification page 1 line 15);

forming a first dielectric layer (12, figure 1a, specification page 1 line 15) on said substrate;

digging a via (14, figure 1a, specification page 1 lines 15-16) in said first dielectric layer and filling said via with metal (specification page 1 lines 15-16);

forming a conductor layer (162/16/164, figure 1b, specification page 1 lines 18-21) on said first dielectric layer including said via;

forming a first photoresist of a first predetermined pattern (182, 184, 186, figure 1c, specification page 1 lines 22-25) on said conductor layer;

removing portions of said conductor layer not covered with said first

---

photoresist to form recesses (15, figure 1d, specification page 1 lines 22-25), leaving the remaining portion as the conducting wire;

removing said first photoresist (see figures 1c-1d);

coating a second dielectric layer (152, figure 1e, specification page 2 lines 1-2) to fill said recesses and performing planarization to expose said conducting wire;

forming a third dielectric layer (17, figure 1e, specification page 2 lines 2-3) on said second dielectric layer and said conducting wire;

forming a second photoresist of a second predetermined pattern (19, figure 1f, specification page 2 lines 4-5) on said third dielectric layer;

Art Unit: 2813

removing portions of said third dielectric layer not covered with said second photoresist to form the contact opening (175, figure 1g, specification page 2 lines 6-7); and

removing the second photoresist (see figures 1f-1g).

APA does not teach:

- forming a metal layer on said conductor such that said photoresist of said predetermined pattern being formed on said metal layer, and removing portions of said conductor layer and metal layer not covered with said photoresist being removed to form the conducting wiring **[claim 7]**;
- wherein the material of said metal layer is different from that of the conductor layer **[claim 8]**;
- wherein the material of said metal layer is tungsten **[claim 9]**.

However, Williams (figures 2-5, col. 2 lines 19-34 and col. 3 lines 4-58) teaches:

forming the metal layer (16, figure 2) of tungsten on the conductor layer (10/12/14), the metal layer being different to the conductor layer; forming the photoresist of predetermined pattern (18, figure 4) on said metal layer; and removing portions of said conductor layer and metal layer not covered with said photoresist to form the conducting wire (figure 5, col. 3 lines 49-52).

Therefore, at the time of invention, it would have been obvious for those skilled in the art to modify process of APA by forming the metal layer and removing the portions of the metal layer and the conductor layer to form the conducting wire as being claimed, per taught by Williams, to improve the process of forming conducting wires with a better

Art Unit: 2813

resolution patterning and less resist erosion (see Williams: col. 2 lines 1-3, 18-21 & 36-34 and col. 3 lines 23-27 & 49-55).

➤ With respect to claims 4-6 and 10-12, APA discloses said conductor layer (162/16/164) has another metal layer (16) and barrier layers (162, 164) formed on the top and bottom surfaces of said another metal layer (specification page 1 lines 18-21) **[claims 4 and 10]**, wherein the material of said another metal layer (16) of the conductor layer is aluminum **[claims 5 and 11]** and the material of the barrier layers (162, 164) is Ti/TiN **[claims 6 and 12]**.

### **Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanhha Pham whose telephone number is (571) 272-1696. The examiner can normally be reached on Monday and Thursday 9:00AM - 9:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

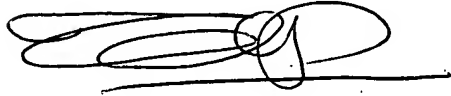
Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should



Art Unit: 2813

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, consisting of several loops and a long horizontal stroke at the end.

Thanhha Pham  
Patent Examiner  
Patent Examining Group 2800

---